IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Applicant::	Hagai Aronowitz	§		
		§		
Serial No.:	Not Known	§	Docket No.:	INTL-0608-US
		§		(P11749)
Filed:	Herewith	§		
		§		
Title:	Decreasing Noise	§		
	Sensitivity In Speech	§		
	Processing Under	§		
	Adverse Conditions	§		

BOX PATENT APPLICATION
Commissioner for Patents
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Dear Sir:

Before examination of the application, please amend the application as follows:

In the Specification:

Please change the following paragraph on page 5, lines 7-17 as follows:

As described in more detail below, in operation, the noise compensation application 27, when executed in conjunction with the authentication database 29, may, in one embodiment, enable the processor-based device 10 to derive the distance measure as a relative distance measure between the two signal portions of the noisy speech signal by distributing the signal attributes across both the signal portions. In one embodiment, to derive the relative distance measure, the noise compensation application 27 receives training speech data including noise

components stored in authentication database 29 and the two signal portions of the noisy speech signal from the audio interface 15. The relative distance measure is obtained in order to calculate a mismatch indicative of a noise differential between the noise components present in the training speech data and the noise attributes present in the two signal portions of the noisy speech signal.

Please change the following paragraph of the Specification on page 6, lines 18-25 as follows:

For assessing the speech included in the noisy speech signal based on the relative distance measure, the signal attributes of the two signal portions of the noisy speech signal may be combined into a first collection indicative of signal content. Likewise, the signal and noise attributes of the two signal portions of the noisy speech signal may be combined into a second collection indicative of a signal and noise content. Using both the collections, a compensation ratio of the signal and noise content to the signal content may be calculated. This compensation ratio may be used to determine the mismatch indicative of the noise differential.

Please change the following paragraph of the Specification on page 14, lines 12-23 as follows:

Although the PMC algorithm performs reasonably well in the case of speaker independent speech recognition, the case of speaker dependent speech recognition poses some problems. One problem relates to artificial addition of noise to the training speech data while compensating for the mismatch. In particular, the distance measure may be over compensated, i.e., reduced too

much. Thus, a final score obtained in this manner may be highly dependent on the noise level. Therefore, if the environment is extremely noisy, a substantial amount of the noise may be added to the training speech data. As a result, a comparison between the secret signature and the test utterance may turn out to be a relative distance measure that indicates a significantly small difference between the noise levels present in the secret signature and the test utterance. Accordingly, almost a negligible distance measure may be attributed to the significantly small difference between the noise levels present in the secret signature and the test utterance.

Please change the following paragraph of the Specification on page 17, lines 10-17 as follows:

While applying the parallel model compensation (PMC) technique to evaluate the speech of the noisy speech signal, in one embodiment, the model 70 (Figure 1B) may be readily compensated in response to the relative distance measure in some embodiments. Thus, noise sensitivity may be reduced, as noise robustness is improved to provide better recognition accuracy (i.e., lower false acceptable or higher rejection rate). In this way, the noise compensation application 27 (Figure 1B) may enable more reliable speech processing in speech or speaker recognition systems that may be operating under adverse conditions (e.g., in noisy environments).

In the Claims:

Please amend the claims as follows:

2. The method of claim 1, wherein deriving the distance measure including deriving a relative distance measure between the at least two signal portions by distributing the signal attributes over the at least two signal portions.

3. The method of claim 2, including:

receiving training speech data including noise components and the at least two signal portions;

combining the signal attributes of the at least two signal portions into a signal content and combining the signal and noise attributes of the at least two signal portions into a signal and noise content;

calculating a compensation ratio of the signal and noise content to the signal content in order to derive the relative distance measure; and

adjusting a mismatch indicative of a noise differential between the noise components present in the training speech data and the noise attributes present in the at least two signal portions based on the relative distance measure.

5. The method of claim 4, including compensating the model in response to the relative distance measure while applying a parallel model combination mechanism.

12. The article of claim 11, further storing instructions that enable the processor-based system to:

derive the distance measure by determining a relative distance measure between the at least two signal portions to distribute the signal attributes over the at least two signal portions.

13. The article of claim 12, further storing instructions that enable the processor-based system to:

receive training speech data including noise components and the at least two signal portions;

combine the signal attributes of the at least two signal portions into a signal content and combine the signal and noise attributes of the at least two signal portions into a signal and noise content;

calculate a compensation ratio of the signal and noise content to the signal content in order to derive the relative distance measure; and

adjust a mismatch indicative of a noise differential between the noise components present in the training speech data and the noise attributes present in the at least two signal portions based on the relative distance measure.

15. The article of claim 14, further storing instructions that enable the processor-based system to compensate the model in response to the relative distance measure while applying a parallel model combination mechanism.

28. The apparatus of claim 27, further comprising:

a storage unit including an authentication database, said storage unit coupled to the control unit to store training speech data in the authentication database, wherein the control unit to:

derive the distance measure from a relative distance measure between the at least two signal portions by distributing the signal attributes over the at least two signal portions.

receive training speech data including noise components and the at least two signal portions to calculate a mismatch indicative of a noise differential between the noise components present in the training speech data and the noise attributes present in the at least two signal portions;

combine the signal attributes of the at least two signal portions into a signal content and combining the signal and noise attributes of the at least two signal portions into a signal and noise content to calculate a compensation ratio of the signal and noise content to the signal content; and

adjust the mismatch with the compensation ratio in order to assess the speech based on the relative distance measure.

Respectfully submitted,

Date: August 13, 2001

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APPENDIX

Please change the following paragraph on page 5, lines 7-17 as follows:

As described in more detail below, in operation, the noise compensation application 27, when executed in conjunction with the authentication database 29, may, in one embodiment, enable the processor-based device 10 to derive the distance measure as a relative [noise] distance measure between the two signal portions of the noisy speech signal by distributing the signal attributes across both the signal portions. In one embodiment, to derive the relative [noise] distance measure, the noise compensation application 27 receives training speech data including noise components stored in authentication database 29 and the two signal portions of the noisy speech signal from the audio interface 15. The relative [noise] distance measure is obtained in order to calculate a mismatch indicative of a noise differential between the noise components present in the training speech data and the noise attributes present in the two signal portions of the noisy speech signal.

Please change the following paragraph of the Specification on page 6, lines 18-25 as follows:

For assessing the speech included in the noisy speech signal based on the relative [noise] distance measure, the signal attributes of the two signal portions of the noisy speech signal may be combined into a first collection indicative of signal content. Likewise, the signal and noise attributes of the two signal portions of the noisy speech signal may be combined into a second collection indicative of a signal and noise content. Using both the collections, a compensation ratio of the signal and noise content to the signal content may be calculated. This compensation ratio may be used to determine the mismatch indicative of the noise differential.

Please change the following paragraph of the Specification on page 14, lines 12-23 as follows:

Although the PMC algorithm performs reasonably well in the case of speaker independent speech recognition, the case of speaker dependent speech recognition poses some problems. One problem relates to artificial addition of noise to the training speech data while compensating for the mismatch. In particular, the distance measure may be over compensated, i.e., reduced too much. Thus, a final score obtained in this manner may be highly dependent on the noise level. Therefore, if the environment is extremely noisy, a substantial amount of the noise may be added to the training speech data. As a result, a comparison between the secret signature and the test utterance may turn out to be a relative [noise] distance measure that indicates a significantly small difference between the noise levels present in the secret signature and the test utterance. Accordingly, almost a negligible distance measure may be attributed to the significantly small difference between the noise levels present in the secret signature and the test utterance.

Please change the following paragraph of the Specification on page 17, lines 10-17 as follows:

While applying the parallel model compensation (PMC) technique to evaluate the speech of the noisy speech signal, in one embodiment, the model 70 (Figure 1B) may be readily compensated in response to the relative [noise] distance measure in some embodiments. Thus, noise sensitivity may be reduced, as noise robustness is improved to provide better recognition accuracy (i.e., lower false acceptable or higher rejection rate). In this way, the noise

compensation application 27 (Figure 1B) may enable more reliable speech processing in speech or speaker recognition systems that may be operating under adverse conditions (e.g., in noisy environments).

In the Claims:

Please amend the claims as follows:

2. The method of claim 1, wherein deriving the distance measure including deriving a relative [noise] distance measure between the at least two signal portions by distributing the signal attributes over the at least two signal portions.

3. The method of claim 2, including:

receiving training speech data including noise components and the at least two signal portions;

combining the signal attributes of the at least two signal portions into a signal content and combining the signal and noise attributes of the at least two signal portions into a signal and noise content;

calculating a compensation ratio of the signal and noise content to the signal content in order to derive the relative [noise] distance measure; and

adjusting a mismatch indicative of a noise differential between the noise components present in the training speech data and the noise attributes present in the at least two signal portions based on the relative [noise] distance measure.

5. The method of claim 4, including compensating the model in response to the relative [noise] distance measure while applying a parallel model combination mechanism.

12. The article of claim 11, further storing instructions that enable the processor-based system to:

derive the distance measure by determining a relative [noise] distance measure between the at least two signal portions to distribute the signal attributes over the at least two signal portions.

13. The article of claim 12, further storing instructions that enable the processor-based system to:

receive training speech data including noise components and the at least two signal portions;

combine the signal attributes of the at least two signal portions into a signal content and combine the signal and noise attributes of the at least two signal portions into a signal and noise content;

calculate a compensation ratio of the signal and noise content to the signal content in order to derive the relative [noise] distance measure; and

adjust a mismatch indicative of a noise differential between the noise components present in the training speech data and the noise attributes present in the at least two signal portions based on the relative [noise] distance measure.

15. The article of claim 14, further storing instructions that enable the processor-based system to compensate the model in response to the relative [noise] distance measure while applying a parallel model combination mechanism.

28. The apparatus of claim 27, further comprising:

a storage unit including an authentication database, said storage unit coupled to the control unit to store training speech data in the authentication database, wherein the control unit to:

derive the distance measure from a relative [noise] distance measure between the at least two signal portions by distributing the signal attributes over the at least two signal portions.

receive training speech data including noise components and the at least two signal portions to calculate a mismatch indicative of a noise differential between the noise components present in the training speech data and the noise attributes present in the at least two signal portions;

combine the signal attributes of the at least two signal portions into a signal content and combining the signal and noise attributes of the at least two signal portions into a signal and noise content to calculate a compensation ratio of the signal and noise content to the signal content; and

adjust the mismatch with the compensation ratio in order to assess the speech based on the relative [noise] distance measure.